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DEVELOPMENT OF UNIFIED SYSTEMS OF DATA COLLECTION AND PROCESSING OF ACCELERATED TESTS OF COMPLEX PRODUCTS

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The assessment and reliability of the design, operation and repair of complex products and systems, which include products of the space, aviation, automobile, shipbuilding industries, radar and navigational stations, flexible automated production, etc., is one of the pressing problems of modern machine building and instrumentation. The welfare, security, independence and authority of Jordan are largely dependent on the successful resolution of this problem.

It should be noted that the reliability of a number of components of complex products can be determined on the basis of information received about their technical condition, in particular the presence of structural-phase heterogeneity in thin (up to 10 microns) surface layers. In order to evaluate these layers, the energy method of control, based on the estimation of anomalies of the distribution of the potential of external energy over the localization of heterogeneities, has recently been used.

The use of the energy method reduces the time spent on conducting research and, thus, provides the obtaining of the necessary data in the accelerated mode of testing. However, there is a problem associated with the need to provide minimal information loss when detecting local structural-phase inhomogeneities and their selection from a set of operating factors in thin surface layers of metal parts and nodes.

Existing methods for today, allowing to strictly control the defects of the surface layer, are imperfect.

The Al-Ahliyya Amman University performed over the last 10 years has proven that the systematic approach to data processing with its centralization and automation is unique in assessing information obtained through testing.

Automated processing of test results combines the disparate results of tests of various parts of complex products carried out at different times and with different purposes in a single system, which allows more efficient, less costly to carry out operational quality management of complex products.

The structure of the automated system and its connection with the external subject domain, which uses the information accumulated in the system, is developed. This structure contains an internal subject area, a subsystem of information gathering and its input into the database and database management system.

For the functioning of the automated system, the structure of the reference base and the document flow has been proposed.

It is shown that one of the most important ways to increase the efficiency of mechanical engineering is the wide introduction of unified solutions. Therefore, an analysis of the unification in this field from the perspective of the systemic approach is of interest, that is, the interconnection between the unification of products and technological equipment. The main reserve for improving the efficiency of the application of unification is to establish a connection between the unified objects of the production cycle, that is, the unified object of the product line should correspond to the unified object of the link "technological process", and to him - the unified object of the link "technological system ", which includes effective means of control during testing.

The conducted researches allowed to reveal the tool of quality assurance and competitiveness of complex products, which includes the developed structural scheme of interconnection of departments and services of controlling divisions of the enterprise and a block diagram of the quality management system with the help of unified systems of accelerated tests.

On the basis of complex experimental studies, it has been proved that the use of direct measurement of the external energy potential during ionization of the surface control area of the parts ensures simultaneous, high accuracy acquisition, analysis and processing of data of accelerated tests of complex products. It has been established that increasing the reliability of the evaluation of the technical state of thin (up to 10 microns) surface layers of metal parts in which the emergence and development of dangerous defects occurs, can be achieved by measuring the parameters of their structural-phase inhomogeneity.

It is shown that information on structural-phase inhomogeneities for the functioning of the diagnostic apparatus complex can be obtained by studying the distribution of the potential of external energy over localization of inhomogeneities with the use of discriminating meters, which is the basis for the development of normative and technical documents for conducting accelerated tests.

The obtained dependencies allowed to develop schemes of a typical technological process for detecting structural-phase inhomogeneity and measuring the gradient of microdeformation of the crystalline lattice of the surface layer of components of complex products. The applied complex makes it possible to carry out research on the surface quality of various physical and chemical characteristics of metals and alloys with sufficient accuracy for production.

The regulatory and technical basis (methodology, algorithm, technological control card) developed at Al-Ahliyya Amman University has been tested and implemented at a number of Jordanian companies in the development of unified systems for collecting and processing data for accelerated tests of complex products.